REMARKS

A Substitute Specification and Abstract is submitted herewith to place the case in better English form. The Substitute Specification and Abstract contains no new matter. In order that the examiner can satisfy himself in this regard, also submitted herewith is a marked-up copy of the original Specification and Abstract from which the Substitute Specification and Abstract was typed.

Respectfully submitted,

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DESCRIPTION

AUTOMATIC TRANSMISSION

Technical Field

The present invention relates to an automatic transmission mounted on a vehicle ~~and so forth~~, and more specifically, it relates to the design ~~construction configuration~~ of an automatic transmission wherein multiple speed levels are each established by ~~enabled by being capable of~~ input~~ting~~ of reduced speed rotation into one of the rotatable ~~rotation~~ components of a planetary gear unit.

Background Art

Generally, a vehicular ~~an~~ automatic transmission ~~on board a vehicle and so forth~~ comprises ~~a planetary gear unit with~~ two ~~rows of~~ linked planetary gear units~~s~~, and planetary gearing for ~~gears that can output the~~ reducing~~ed~~ ~~rotation wherein~~ the ~~rotation~~ speed of rotation received from the input shaft ~~is reduced~~ (for example, see Japanese Unexamined Patent Application Publication No. 4-125345). Such a transmission ~~This~~ achieves, for example, six forward speeds and one reverse speed, by ~~being capable of~~ input of reduced speed rotation from the planetary gearing via a clutch to, for example, one rotary ~~rotation~~ component of a planetary gear unit that has four rotary ~~rotation~~ components. Further, in the case of fifth speed forward, for example, when the rotation of the input shaft is simultaneously input ~~together~~ into two of the rotary ~~rotation~~ components of the

planetary gear unit by engaging ~~the~~ two clutches, this fifth speed forward ~~can be become~~ speed is a directly coupled state, with ~~a~~ rotation similar to that of the input shaft (see Japanese Unexamined Patent Application Publication No. 2000-274498, for example).

The above-described automatic transmission comprises two clutches for input~~ting~~ of the rotation of the input shaft into two of the rota~~tion~~ry components of the aforementioned planetary gear unit, and ~~a~~ planetary gearing for ~~outputting the reduced~~ reducing the speed of input rotation into the rota~~tion~~ry components of this planetary gear unit. However, if those two clutches or the oil servos that control the engag~~ing~~ment of those clutches are ~~configured~~ located between the planetary gear unit and the speed-reduction planetary gearing, the ~~unit~~ element(s) for transmitting the reduced rotation of this speed-reduction planetary gearing to the rota~~tion~~ry components of the planetary gear unit ~~becomes long in the~~ must be axially ~~direction~~ lengthened.

~~That the unit~~ The axial lengthening of the element(s) that transmits the reduced speed rotation ~~becomes long~~ means that the unit transmitting a large torque is elongated, and an elongated unit that can withstand the large torque requires ~~providing~~ elongation of a relatively thick material ~~that is elongated~~, preventing a compact automatic transmission. Further, the weight of such a unit would be heavier, and not only would a lightweight automatic transmission ~~be prevented~~ become impossible, but inertia (~~force of~~ inertial force) would increase, thereby reducing the controllability of the

automatic transmission and speed change shocks would ~~result~~ become more ~~easily~~ likely to occur.

~~Further, for example,~~ In order to engage or disengage the reduced speed rotation output to the planetary gear unit from the speed reduction planetary gearing, a clutch or brake must be provided. ~~In the case that~~ When a clutch is provided, this clutch and the above-~~described~~ mentioned two clutches, in other words three clutches, are necessary. In general, a clutch has a drum-shaped member (clutch drum) that transmits the input rotation to the friction plates, and therefore, for example with a problem such as relative rotation, supply~~ing~~ of oil pressure to the oil compartment of the ~~oil pressure~~ hydraulic servo of the clutch must ~~be supplied~~ come from the mid-section of the automatic transmission.

However, ~~for example~~ if ~~those~~ the required three clutches are ~~configured~~ located on one axial side ~~in the direction of the axis~~ of the planetary gear unit, oil lines for supplying oil pressure to three ~~oil pressure~~ hydraulic servos are ~~constructed for example~~ provided in triplicate in the mid-section of the automatic transmission, and the configuration of the oil lines becomes complicated.

SUMMARY OF THE INVENTION

Accordingly, the object of the present invention is to provide an automatic transmission ~~that configures~~ wherein a reduced speed rotation output means is located on one axial side ~~in the axial direction~~ of the planetary gear unit, and ~~configures~~ a first clutch and a second clutch ~~in the axial direction~~ are located on the other axial side of

the planetary gear unit, and hence to solve the problems mentioned above.

~~Disclosure of Invention~~

In one aspect, the present invention ~~according to Claim 1~~ is an automatic transmission comprising: an input shaft ~~that~~ rotat~~es based on~~ably driven by output ~~rotation~~ of a drive source; a planetary gear unit comprised of first, second, third, and fourth ~~rotation~~ rotary components; reduced speed rotation output means for reducing the speed of rotation of the input shaft and for ~~capable of~~ output of a reduced speed rotation to the first ~~rotation~~ rotary component ~~from the input shaft wherein the rotation speed is reduced~~; a first clutch for selectively engaging/disengaging ~~that links~~ the input shaft to/from ~~and~~ the second rota~~tion~~ry component ~~in a manner capable of disengaging~~; a second clutch for selectively engaging/disengaging ~~that links~~ the input shaft ~~and~~ to/from the third rota~~tion~~ry component ~~in a manner capable of disengaging~~; and an output unit for outputting the rotation of the fourth rota~~tion~~ry component ~~in~~to the drive wheels ~~transmitting device~~; wherein at least five forward speeds ~~levels~~ and one reverse speed ~~level can be~~ are achieved, and wherein a direct ~~linking level~~ coupled state can be achieved wherein the rotation~~s~~ of the input shaft ~~are~~ is output without change in speed by engagement of the first clutch and the second clutch ~~being engaged~~ while ~~at~~ in a fifth speed forward ~~at least,~~ or higher; and wherein the reduced speed rotation output means is ~~configured~~ located on one axial side ~~in the axial direction~~ of the planetary gear unit, and ~~the~~ an

output member is ~~configured~~ located between the planetary gear unit and the reduced speed rotation output means; and wherein the first clutch and the second clutch are ~~configured~~ located on the other axial side ~~in the axial direction~~ of the planetary gear unit.

Accordingly, while providing an automatic transmission which is directly coupled ~~when at~~ in fifth speed forward, which ~~can~~ provides ~~achieve~~ at least five forward speeds ~~levels~~ and one reverse speed ~~level~~, the reduced rotation output means and the planetary gear unit can be ~~configured~~ located closer together, as compared to the case wherein a clutch is ~~configured~~ located between the reduced speed rotation output means and the planetary gear unit, for example, and the transmitting ~~member~~ element(s) for transmitting the reduced speed rotation can be made relatively short. Therefore, the automatic transmission can be made compact and lightweight, and further, because the inertia ~~(force of~~ (inertia force) can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced. Further, in the case that, for example, the reduced speed rotation output means has a clutch, three clutches ~~will be configured~~ are required, but compared to the case wherein three clutches are ~~configured~~ located on one side of the planetary gear unit, the construction of ~~an~~ the oil lines ~~to provide oil to the~~ which supply oil pressure to the hydraulic servos for these clutches ~~can be made easily~~ is simplified, ~~and~~ the manufacturing process ~~can be~~ is simplified and the manufacturing costs ~~brought down~~ are reduced.

Further, because the output unit is ~~configured in the~~ located axial ~~direction between~~ intermediate the planetary gear unit and the reduced speed rotation output means, the output unit can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on ~~the~~ a vehicle, enlarg~~ing~~ement toward~~s one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side for receiving power from the drive source is the front ~~direction~~) ~~can be prevented~~ becomes unnecessary because the output unit is mounted to ~~match~~ mate with the drive wheel transmission mechanism. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, and the mountability on a vehicle ~~can be~~ is improved. ~~such~~ The steering angle ~~being~~ is greatly improved, for example.

~~The present invention according to Claim 2 is configured such that~~ The reduced rotation output means ~~comprises~~ preferably includes a speed reducing planetary gear unit that has a reduced speed rota~~tion~~ry component that rotates at the reduced speed rotation and a third engaging component ~~that can operate~~ for controlling the rotation of ~~the~~ a ~~specified~~ component of ~~this~~ the speed reducing planetary gear unit.

No ¶ ~~The present invention according to Claim 3 is configured such that~~ Preferably, the third engaging component ~~is an engaging component which~~ engages in the first speed forward.

~~With the present invention according to Claim 4~~, the speed reducing planetary gear unit perferably includes ~~comprises~~ an input rota~~tion~~ry

and ~~a~~ third component that is fixed for speed reduction, whereby the reduced speed rotary component rotates at a speed

continuously receives as

component that inputs ~~at all times~~ the rotation of the input shaft, ~~a rotation fixing component that fixes the rotation,~~ ~~and~~ a reduced speed ~~rotation~~ rotary component that ~~can reduce~~ rotates ~~rotation~~ at a reduced speed based on the rotation of ~~this~~ the input ~~rotation~~ rotary component ~~and this rotation fixing~~ and fixation of third component; and the third engaging component is a third clutch ~~that links~~ for engaging/disengaging the reduced speed ~~rotation~~ rotary component ~~and~~ to/from the first ~~rotation~~ rotary component. ~~so as to be capable of disengaging~~.

Accordingly, because the reduced speed rotation output means ~~comprises the~~ includes a third clutch, three clutches ~~will be configured~~ in total are required, but because the speed ~~reduced rotation output means~~ reducing second planetary gear unit is ~~configured~~ located on one axial side ~~in the axial direction~~ of the first planetary gear unit, and the first clutch and the second clutch are ~~configured~~ located on the other side ~~in the~~ axial ~~direction of planetary gear unit~~, compared to ~~the case~~ a design wherein these three clutches are ~~configured~~ located on one side of the first planetary gear unit, the construction of an oil line to provide oil to the ~~oil pressure~~ hydraulic servos for these clutches ~~can be made easily~~ is simplified, ~~and~~ the manufacturing process ~~can be~~ is simplified and the manufacturing costs ~~brought down~~ are reduced.

~~With the present invention according to Claim 5,~~ The third clutch is ~~configured~~ preferably located on the ~~opposite~~ side ~~in the~~ axially of the first planetary gear unit, opposite ~~direction of~~ the speed reducing (second) planetary gear unit, ~~from the first planetary gear~~ unit; and the third clutch comprises ~~an oil pressure~~ a third hydraulic servo that ~~pressurizes a~~ engages friction members, a drum

¶ In some of the preferred embodiments the third non-rotatable component is a carrier fixed to the transmission case through an end plate and in other preferred embodiments is a carrier which is fixed against rotation by engagement by a rotatable brake.

unit that is constructed integrally with the ~~oil pressure~~ third hydraulic servo and opens toward ~~the direction of~~ the speed reducing planetary gear unit, and a hub unit; wherein the ~~oil pressure~~ third hydraulic servo ~~of the third clutch~~ is disposed on a boss ~~portion~~ extending from the case, and oil is supplied to the ~~oil~~ hydraulic ~~pressure~~ servo from an oil path ~~provided to~~ in the boss, ~~portion.~~

In another embodiment ~~The present invention according to Claim 6 is configured with~~ the speed reducing second planetary gear unit includes the ~~comprising an~~ input ~~rotation~~ rotary component that ~~can~~ receives as input the rotation of the input shaft, ~~a rotation fixing component that~~ a third component fixed against ~~the~~ rotation, and a reduced speed rota~~tion~~ry component that ~~can reduce~~ rotates at a reduced ~~rotation~~ speed based on the rotation of ~~this~~ The input rota~~tion~~ry component and ~~this rotation~~ the fix~~ing component~~ed carrier; wherein the third engaging component is a third clutch that ~~links~~ engages/disengages the input shaft ~~and~~ to/from the input rot~~ation~~ary component, ~~so as to be capable of disengaging~~.

Accordingly, in the latter embodiment described also, because the speed reduc~~ed~~ing second planetary unit ~~rotation output means~~ comprises the third clutch, three clutches ~~will be~~ are required ~~configured~~, but ~~because~~ here too the speed reduc~~ed~~ing second planetary gear unit ~~rotation output means~~ is located ~~configured~~ on ~~one~~ the side ~~in the axial direction~~ of the first planetary gear unit ~~and~~ opposite the first and second clutch~~es~~ ~~and the second clutch are configured on the other side in the axial direction of planetary gear unit, compared to the case wherein these three clutches are configured on one side of the planetary gear unit, the construction of an oil line to~~

~~provide oil to the oil pressure servos for these clutches can be made easily, and the manufacturing process can be simplified and the costs brought down.~~

Further, because engagement of the third clutch ~~links~~ connects the input shaft and the input rota~~tion~~ry component ~~so as to be capable of disengaging~~, the ~~burden~~ load on the third clutch can be reduced, and the third clutch can be made more compact, as compared with ~~for example~~ the case wherein the third clutch ~~makes~~ connects the input rota~~tion~~ry component and the first rota~~tion~~ry component. ~~capable of disengaging.~~

~~With the present invention according to Claim 7,~~ The third clutch comprises ~~an oil pressure~~ a hydraulic servo that ~~pressurizes a~~ engages friction members, a drum unit that is constructed integrally with the ~~oil pressure~~ hydraulic servo, and a hub unit; wherein the hub unit is linked with the input rota~~tion~~ry component; and wherein the drum unit is linked to the input shaft, and is positioned so as to open toward the ~~direction of the~~ speed reducing second planetary gear unit.

Also, the input rota~~tion~~ry component which rotates at a high ~~revolution when at~~ speed in sixth speed forward can be linked to the hub unit which has a smaller diameter than the drum unit, and as ~~and~~ compared to the case wherein it is linked to the drum unit, the centrifugal force ~~can be~~ is reduced, and ~~the decrease of~~ controllability of operation of the third clutch ~~when engaging and releasing can be prevented~~ is improved.

~~The present invention according to Claim 8 is configured with~~ The oil pressure servo of the third clutch may be mounted ~~disposed~~ on the input shaft, whereby it can receive ~~an oil is~~ supply of oil ~~ied to the oil pressure servo of the third clutch~~ via an oil path ~~provided~~ within the input shaft. Alternatively,

No ¶ ~~The present invention according to Claim 9 is configured with~~ the hydraulic ~~oil pressure~~ servo of the third clutch may be mounted ~~disposed~~ on a boss ~~portion~~ extending from the case, whereby it can receive supply of oil ~~is supplied to the oil pressure servo of the third clutch~~ via an oil path ~~provided~~ within the boss ~~portion~~.

¶ In another embodiment ~~The present invention according to Claim 10 is configured with~~ the speed reducing second planetary gear unit comprises ~~comprising~~ an input rotary ~~rotation~~ component that receives as input~~s~~ the rotation of the input shaft, a ~~fixing rotation component that fixes the rotation, and~~ a reduced speed rotary ~~rotation~~ component and a rotatable third component, whereby said reduced speed rotary component ~~that can reduce~~ exits at a reduced ~~rotation~~ speed based on the rotation of the input rotary ~~rotation~~ component ~~and~~ with the rotatable third ~~rotation fixing~~ component~~s~~ fixed against rotation, and wherein the third engaging component is a third brake ~~that is capable of~~ for fixing the rotatable third component against rotation ~~fixing rotation component~~.

~~With the present invention according to Claim 11,~~ The third brake may be located ~~is configured~~ on the ~~opposite~~ side ~~in the~~ axial of the first planetary gear unit opposite ~~direction of~~ the speed reducing planetary gear unit, ~~from the planetary gear~~; and the hydraulic ~~oil pressure~~ servo of the third brake may be formed in the end ~~is configured on the edge~~ wall of the case.

In another preferred embodiment ~~The present invention according to Claim 12 is~~

~~configured such that~~ the first clutch ~~is a clutch that~~ engages ~~at the~~ in first speed reverse.

No 4 Accordingly, when ~~engaged at the~~ in reverse ~~speed level~~, one ~~the~~ unit (particularly the transmitting member) rotates in reverse at ~~for~~ the reduced speed rotation ~~of~~ from the reduced speed rotation output means, while ~~rotates in a reverse rotation, while there may be cases wherein by engaging this~~ with the first clutch engaged, the unit connecting the ~~this~~ first clutch and the second ~~rotation~~ rotary component rotates at the ~~rotation~~ speed of the input shaft, ~~and~~ in some cases ~~may occur wherein~~ the ~~revolution~~ difference between these speeds ~~thereof~~ may be large. However, because the ~~this~~ first clutch is located on the ~~opposite~~ side of the first planetary gear unit opposite the reduced speed rotation output means, ~~via the~~ ~~that is to say,~~ the unit with ~~a~~ reverse rotation (particularly the transmitting member) and the unit rotating at the speed ~~with the rotation~~ of the input shaft can be ~~configured~~ spaced apart, and compared with the case wherein for example those units are ~~configured~~ in contact ~~with~~ in a multi-axial construction, a ~~the~~ decrease~~d~~ in efficiency of the automatic transmission resulting from the relative rotation between ~~those~~ these units can be prevented.

In another preferred arrangement ~~With the present invention according to Claim 13~~, the first clutch ~~is configured~~ adjoins ~~to~~ the first planetary gear unit~~; wherein the first clutch~~ 2nd comprises ~~a~~ friction members, a hydraulic servo ~~and an oil pressure~~ servo that causes the ~~pressurizes this~~ friction members to engage~~,~~ and a drum unit and a hub unit that are constructed

1st clutch C2

integral~~ly~~ with the ~~this oil pressure~~ servo. In this preferred configuration ~~and wherein the~~ the drum unit is linked with the input shaft, and the hub unit is linked with the second rotary ~~rotation~~ component. Further ~~and wherein~~ the second clutch is ~~configured~~ on the ~~opposite~~ side of ~~in~~ the axially opposite ~~direction of the~~ speed second reducing planetary gear unit ~~from~~ the first clutch. Here, ~~and wherein~~ the second clutch also comprises ~~a~~ friction members and a hydraulic ~~an oil pressure~~ servo that causes the ~~pressurizes this~~ friction members to engage, and a drum unit and a hub unit that are ~~constructed~~ integrally with this hydraulic ~~oil pressure~~ servo. In such an embodiment ~~and wherein~~ the drum unit of the second clutch is linked with the input shaft, and the hub unit is linked with the third rotary ~~rotation~~ component, radially inward ~~through the outer circumference side~~ of the first clutch.

?

2nd clutch

2nd embod Fig. 4

Note 13

compare claim 13

reversed

The present invention may ~~according to Claim 14~~ further include ~~comprises~~ a first brake capable of fixing ~~retaining rotations of~~ the second rotary ~~rotation~~ component against rotation, and a second brake for braking ~~capable of retaining rotations of~~ the third rotary ~~rotation~~ component, with ~~wherein~~ the first brake is located radially outward ~~configured on the outer circumference side~~ of the first clutch, and ~~wherein~~ the second brake ~~is~~ located located radially outward ~~configured on the outer circumference~~ side of the first planetary gear unit.

~~The present invention according to Claim 15 is configured with~~ The first brake includes ~~comprising a~~ friction members and a hydraulic ~~an oil pressure~~ servo that causes engagement of the ~~pressurizes this~~ friction members. The hydraulic ~~wherein the oil pressure~~ servo of the first brake is preferably located ~~configured at the outer circumference side in the~~ radially

~~direction~~ outward of the ~~oil pressure~~ hydraulic servo of the first clutch, at a position ~~so as to overlap~~ at least ~~a part in the~~ partially axially overlapping same ~~direction; and wherein~~ The friction members of the first brake ~~is linked~~ include plates splined to the case and intermeshed therewith, plates splined to the hub unit of the first clutch.

~~With the present invention according to Claim 16~~ Likewise, the second brake ~~comprises a~~ includes friction members and ~~an oil pressure~~ a hydraulic servo that ~~pressurizes this~~ controls engagement/disengagement of the friction members. ~~and the oil pressure~~ The hydraulic servo of the second brake is ~~disposed on case material~~ preferably formed in a portion of the case, in radially inward as a transverse wall which extend~~ed so as to~~ rotatably supports the output member, and ~~wherein~~ the friction members of the second brake are ~~is disposed on the outer circumference side~~ are preferably located radially outward of the first planetary gear unit.

~~With the present invention according to Claim 17,~~ A transmitting member ~~that~~ links the reduced speed rota~~tion~~ ~~component~~ element of the second planetary gear unit or the third engaging component and the first ~~rotation component~~ rotary element of the first planetary gear, said transmitting member including an axially extending portion ~~unit is linked together while passing through the inner circumference side~~ radially inward of the output unit.

The automatic transmission of the present invention ~~according to Claim 18~~ may further ~~comprises~~ include a differential unit for outputting rotation~~s~~ to The drive~~ing~~ wheels, and a counter shaft unit for engaging the differential unit, wherein the output member is a counter gear meshing with the counter shaft unit.

~~The present invention according to Claim 19 is~~

~~configured such that wherein, in a speed line chart illustrating the revolutions of the first, second, third, and fourth rotation components with the vertical axis, and the gear ratio of the first, second, third, and fourth rotation components with the horizontal axis in a corresponding manner; the first rotation component to which the reduced rotation is input is positioned at the farthest edge in the horizontal direction, with the fourth rotation component linked to the output member, the third rotation component, and the second rotation component, corresponding in that order.~~

In a preferred embodiment ~~With the present invention according to Claim 20~~, the first planetary gear unit is a multiple type planetary gear unit, comprising a first sun gear, a long pinion which meshes with the first sun gear, a short pinion which meshes with the long pinion, a carrier for rotationally supporting the long pinion and the short pinion, a second sun gear meshing with the short pinion, and a ring gear meshing with the long pinion. In this preferred embodiment, ~~wherein~~ the first rota~~tion~~ry component is the second sun gear which receives ~~capable of inputting~~ the reduced speed rotation of the reduced speed rotation output means, ~~and wherein~~ the second rota~~tion~~ry component is the first sun gear which is rotatably ~~capable of inputting rotations of~~ driven by the input shaft with ~~by the engaging of~~ the first clutch engaged, and which is ~~capable of being~~ fixed against rotation by the engagement ~~retaining~~ of the first brake, ~~and wherein~~ the third rota~~tion~~ry

~~component~~ is ~~the~~ a carrier ~~capable of~~ which receives input~~ting the~~ rotation~~s~~ of ~~of~~ from the input shaft ~~by the~~ upon engag~~ing~~ement of the second clutch, and which is ~~capable of being~~ fixed against rotation by ~~the retaining~~ engagement of a second brake~~s~~, and ~~wherein~~ the fourth rota~~tion~~ry component is ~~the~~ a ring gear linked to the output member.

~~The present invention according to Claim 21 is configured wherein~~ In the preferred embodiment described immediately above, in ~~the~~ first speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the second brake is engaged. ~~retained; and wherein,~~ In ~~the~~ second speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced rotation output means, and the first brake is engaged. ~~retained; and wherein,~~ In ~~the~~ third speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the first clutch is engaged. ~~and wherein,~~ In ~~the~~ fourth speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the second clutch is engaged. ~~and wherein,~~ In ~~the~~ fifth speed forward, the first clutch and the second clutch are both engaged~~;~~ and ~~wherein,~~ in ~~the~~ sixth speed forward, the second clutch and first brake are ~~is~~ engaged. ~~and the first brake is retained; and wherein,~~ In ~~the~~ first speed reverse, the first clutch and second brake are ~~is~~ engaged ~~and the second brake is retained, whereby~~. Thus, in the foregoing preferred embodiment six forward speed~~ level~~s and one reverse speed ~~level can be achieved~~ are provided.

Brief Description of the Drawings

Fig. 1 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a first embodiment of the present invention; ¶ Fig. 2 is a operations ~~al~~ table of ~~an~~ for the automatic transmission ~~relating to~~ of the first embodiment; ¶ Fig. 3 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the first embodiment; ¶ Fig. 4 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a second embodiment of the present invention. ¶ Fig. 5 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ of an automatic transmission ~~relating~~ according to a third embodiment of the present invention; ¶ Fig. 6 is a table of operations ~~al table~~ of an automatic transmission ~~relating~~ according to the third embodiment; ¶ Fig. 7 is a speed line diagram ~~of~~ for an automatic transmission ~~relating~~ according to the third embodiment; ¶ Fig. 8 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a fourth embodiment of the invention; ¶ Fig. 9 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of of an automatic transmission ~~relating~~ according to a fifth embodiment; ¶ Fig. 10 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a sixth embodiment; ¶ Fig. 11 is a table of operations ~~al~~

~~table of~~ for an automatic transmission ~~relating~~ according to the sixth embodiment; and Fig. 12 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the sixth embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

~~Best Mode for Carrying Out the Invention~~

First Embodiment

~~The~~ A first embodiment ~~relating to~~ of the present invention will be described, with reference to ~~following~~ Fig. 1 through Fig. 3, ~~below~~.

~~Fig. 1 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the first embodiment, Fig. 2 is a operational table of an automatic transmission relating to the first embodiment, and Fig. 3 is a speed line diagram of an automatic transmission relating to the first embodiment.~~

~~An~~ The automatic transmission 1, ~~relating to~~ of the first embodiment ~~according to~~ of the present invention, ~~has an automatic transmission device 1_1~~ as illustrated in Fig. 1, ~~This~~ is particularly ~~favorable~~ useful for ~~an~~ FF (front engine, front wheel drive) vehicle, and has a case comprising a housing ~~case, not illustrated, and a transmission case 3, and within this housing case is configured~~ for a torque converter, not illustrated, ~~within this~~ and a transmission case 3 ~~is configured an~~ housing automatic transmission ~~device~~ 1_1, a counter shaft unit (drive wheel transmission mechanism), not illustrated, and a differential unit (drive wheel

transmission mechanism).

~~This~~ The torque converter is ~~configured, for example,~~ located on ~~the~~ an axis ~~that is~~ centered on an input shaft 2 of the automatic transmission device 1_1, which is on the same axis as the output shaft of the engine(not illustrated). ~~and this automatic transmission device 1_1 is configured on the output shaft of this engine, in other words, the axis that is centered on the input shaft 2~~. Further, the ~~above-mentioned~~ counter shaft unit ~~is configured on~~ includes a counter shaft (not illustrated) on an axis that is parallel to the input shaft 2, and the above-mentioned differential unit ~~is configured so as to~~ has a lateral axle, not illustrated, on an axis that is parallel to ~~this~~ the counter shaft.

~~Next, an automatic transmission device 1_1 of an automatic transmission relating to the first embodiment will be described, with reference to Fig. 1~~. As illustrated in Fig. 1, the automatic transmission ~~device~~ 1_1 comprises a first planetary gear unit PU and a second planetary gear unit (~~reduced~~ speed ~~rotation output means,~~ reducing planetary gear unit) PR on the input shaft 2. ~~This~~ The first planetary gear unit PU is a multiple-type planetary gear unit, which has a sun gear S2 (the second ~~rotation~~ rotary component), a carrier CR2 (the third ~~rotation~~ rotary component), a ring gear R3 (the fourth ~~rotation~~ rotary component), and a sun gear S3 (the first ~~rotation~~ rotary component), as the four ~~rotation~~ rotary components. ~~wherein~~ The carrier CR2 has a long

pinion PL that meshes with a sun gear S2 and the ring gear R3, and a short pinion PS that meshes with the sun gear S3, and the pinions PL and PS ~~which~~ are meshed ~~to~~ with one another. Further, the ~~above-mentioned~~ second planetary gear unit PR is a double pinion planetary gear unit that has a carrier CR1, wherein a pinion Pb is meshed with a ring gear R1 and a pinion Pa is meshed with a sun gear S1, and the pinions Pa and Pb ~~which~~ are meshed one to another.

~~On the above-mentioned input shaft 2 is provided a~~ A boss ~~unit~~ 3a ~~that is~~ extend~~ed on~~s from one ~~edge~~ end of the case 3 and form~~ed~~s ~~in~~ a sleeve surrounding one end of ~~form on this~~ input shaft 2, and on this boss ~~unit~~ 3a is ~~configured~~ mounted a multi-disc clutch C1 "reduced speed rotation output means," the "third engaging component," the "third clutch" comprising ~~an oil pressure~~ a hydraulic servo 11, ~~a~~ friction plates 71, and a ~~drum-shaped member~~ clutch drum 21. ~~that forms a clutch drum.~~

~~This oil pressure~~ Hydraulic servo 11 ~~is constructed from~~ includes a piston unit b for ~~pressurizing~~ pressing against the friction plates 71, ~~the drum-shaped member~~ the clutch drum 21 that has a cylinder unit e, an oil chamber "a" which is formed ~~by~~ as a seal~~ing~~ed area between ~~this~~ the piston unit b and ~~this~~ the cylinder unit e with seal rings f and g, ~~A~~ a return spring c ~~that energizes this~~ biasing the piston unit b towards ~~this~~ oil chamber "a", and a return plate d that ~~absorbs the energy of this~~ supports one end of return spring c.

~~Now, for the following descriptions,~~ Each ~~oil pressure~~ hydraulic servo ~~shall be considered as being~~ is constructed similarly

with ~~from~~ an oil chamber "a", a piston unit b, a return spring c, a return plate d, a cylinder unit e, and seal rings f and g, and as such, description thereof will not be repeated ~~omitted~~.

The oil chamber "a" of hydraulic ~~this oil pressure~~ servo 11 is in communication with ~~linked to~~ an oil line 92 in ~~of~~ the boss ~~unit~~ 3a, and this oil line 92 is linked to an oil pressure control device not illustrated. ~~In other words,~~ Because the ~~above-mentioned~~ hydraulic ~~oil pressure~~ servo 11 is located ~~configured~~ on the boss ~~unit~~ 3a, an oil connection ~~line~~ from the oil pressure control unit (not illustrated) to the oil chamber "a" of the oil pressure servo 11 ~~is~~ can be formed ~~constructed~~ by one set of seal rings 80 which form a ~~to~~ seal between the ~~this~~ boss ~~unit~~ 3a and the clutch drum ~~shaped member~~ 21.

~~Further, the above-mentioned~~ The boss ~~unit~~ 3a ~~is~~ rotatably supports ~~supported~~ ~~by the above-mentioned drum shaped member~~ the clutch drum 21. ~~so as to be capable of rotating, and on~~ Friction plates 71 are splined to the inner circumferential surface ~~circumference side of~~ of a section ~~the~~ front ~~edge~~ of ~~this drum shaped member~~ the clutch drum 21 ~~is configured~~ and are ~~the friction plate 71 of the clutch C1 which is capable of~~ ~~engaging by the oil pressure~~ engaged /disengaged by hydraulic servo 11 for the clutch C1. ~~by being splined.~~ The ~~inner circumference side of the~~ friction plates 71 ~~of this clutch C1 is~~ are intermeshed with friction plates) splined to the outer surface of the ring gear R1 ~~the hub unit 31~~ ~~where the ring gear R1 is formed, and this~~ which forms part of the hub unit 31 which is rotatably supported by the boss ~~unit~~ 3a. ~~so as to be capable of rotating. Further,~~ The carrier CR1 has ~~the pinion Pa and the pinion Pb, the~~ pinion Pb which meshes with the ~~above-mentioned~~ ring gear R1, and the pinion Pa which meshes with the sun gear S1

which, in turn, is connected to the input shaft 2. This carrier CR1 is secured to the boss ~~unit~~ 3a of the case 3 via a side plate, and the sun gear S1 is connected to the input shaft 2.

~~Also,~~ The ~~drum-shaped member~~ clutch drum 21 ~~wherein the friction plate 71 of the above-mentioned clutch C1 is splined to a~~ is connected to one end of a transmitting member (the reduced rotation output means) 30, that transmits the rotation of the ring gear R1 when ~~this~~ clutch C1 is engaged, and ~~on~~ the other ~~side of this~~ end of the transmitting member 30 is connected to the sun gear S3 of the above-mentioned first planetary gear unit PU. ~~is connected.~~

~~On the other hand, on~~ At the other ~~edge~~ end of the input shaft 2 (left side of diagram) is located a multi-disc clutch C3 (the second clutch) ~~is configured that comprises an oil pressure~~ which includes a hydraulic servo 13, ~~a~~ friction plates 73, a ~~drum-shaped member~~ clutch drum 25 ~~that forms a clutch drum~~, and a hub unit 26. Further, ~~on the~~ boss ~~unit~~ 3b ~~that is elongated on the other side~~ extends axially from the left (in Fig. 1) end of the case 3 ~~on the opposite side from the above-mentioned boss unit 3a, and is provided on~~ and forms a sleeve around and supports the input shaft 2 ~~in sleeve form, is configured~~ a multi-disc clutch C2 (the first clutch) ~~comprising an oil pressure~~ including a hydraulic servo 12, ~~a~~ friction plates 72, a ~~drum-shaped member~~ clutch drum 23 ~~that forms a clutch drum~~, and a hub unit 24. Further, ~~on the outer circumference side of this~~ radially outward of clutch C2 is ~~configured~~ located a multi-disc brake B2 comprising ~~an oil pressure~~ a hydraulic servo 15 and ~~a~~ friction plates 75, such that at least a part thereof axially overlaps the ~~oil pressure~~ hydraulic servo 12. ~~in the axial direction.~~

The oil chamber "a" of ~~this oil pressure~~ hydraulic servo 13 ~~is linked to~~ connects an oil line 2b formed on ~~this above-mentioned~~ input shaft 2, and this oil line 2b ~~is linked through~~ connects with an oil line 93 ~~of~~ in the ~~above-mentioned~~ boss ~~unit~~ 3b, and ~~this oil~~ line 93, in turn, is linked ~~through~~ to an oil pressure control device, not illustrated. In other words, the connection between the oil chamber "a" of hydraulic ~~above-mentioned oil pressure~~ servo 13 ~~has an oil line constructed from~~ and the oil pressure control device, not illustrated, ~~to the oil chamber "a" of the oil pressure servo 13,~~ is formed by one set of seal rings 82 that provide a seal between the boss ~~unit~~ 3b of the case 3 and the input shaft 2.

The oil chamber "a" of the above-mentioned oil pressure servo 12 ~~is linked through~~ connects to an oil line 94 of the ~~above-mentioned~~ boss ~~unit~~ 3b, and this oil line 94 ~~is linked through to~~ connects with the oil pressure control device, not illustrated. In other words, the connection between the oil chamber "a" of hydraulic ~~for the above-mentioned oil pressure~~ servo 12 ~~an oil line is constructed from~~ and the oil pressure control device, not illustrated, ~~to the oil chamber "a" of the oil pressure servo 12,~~ is formed by one set of seal rings 83 that provide a seal between the boss ~~unit~~ 3b of the case 3 and an extension of clutch drum ~~the drum-shaped~~ member 23.

The ~~drum-shaped member~~ clutch drum 25 of the ~~above-mentioned~~ clutch C3 is connected to the input shaft 2, and splined to a ~~on the~~ front ~~edge~~ portion of the inner circumferen~~ce side of this drum-shaped member~~tial surface of clutch drum 25 ~~is configured a~~ are friction plates 73 ~~of the clutch C3~~ that

~~is capable of engaging by the oil pressure~~ are engaged/disengaged by hydraulic servo 13, ~~for the clutch C3, by being splined. On~~ The ~~inner circumference side of the~~ friction plates 73 of ~~this clutch C3 is~~ are intermeshed with frict plates splined to ~~configured~~ a hub unit 26 ~~by being splined~~, and this hub unit 26 is connected to the carrier CR2.

The ~~drum-shaped member~~ clutch drum 23 of the ~~above-mentioned~~ clutch C2 is connected to the input shaft 2, and ~~on the front edge of the~~ the inner circumferential surface of clutch drum ~~side of this drum-shaped member~~ 23 ~~is configured a~~ has friction plates 72 splined thereto which are ~~of the clutch C2 that is capable of engaging~~ engaged/disengaged by the ~~oil pressure~~ hydraulic servo 12. ~~for the clutch C2, by being splined. On the inner circumference side of~~ The friction plates 72 of ~~this~~ clutch C2 ~~is~~ are intermeshed with friction pl splined to ~~configured~~ a hub unit 24, ~~by being splined, and on~~ are intermeshed with friction plates splined to the outer circumferential surface ~~side~~ of ~~this~~ hub unit 24 ~~is configured by splining a~~ friction plates 75 of the brake B2 ~~that is capable of engaging by the oil pressure~~ and are engaged/disengaged by hydraulic servo 15 for the brake B2. ~~Also,~~ This hub unit 24 is also connected to the sun gear S2.

On ~~the other hand, on~~ the radially outer ~~circumference~~ side of the planetary gear unit PU is ~~configured~~ a multi-disc brake B1 (second brake) that comprises ~~an oil pressure~~ a hydraulic servo 14, ~~a~~ friction plates 74, and a hub unit 28. The ~~oil pressure~~ hydraulic servo 14 is formed in ~~disposed on~~ a member (extending radially inward) ~~extended~~ from the case 3 and ~~for~~ rotatably supporting a ~~later described~~ counter gear 5. Also, a ~~to the~~ side plate of the carrier CR2 of the first ~~this~~ planetary gear unit PU is connected to ~~the~~ hub unit 28 to which are splined ~~with~~ the friction plates meshing with friction plate

74 of the above-mentioned brake B1. ~~and~~ Further, ~~this~~ hub unit 28 is connected to the inner race of a one-way clutch F1. The sun gear S3 is meshed with the short pinion PS of this carrier CR2, and the above-mentioned sun gear S2 and ring gear R3 are meshed with the long pinion PL of this carrier CR2. Also, a linking member ~~unit~~ 27 is connected to one end ~~edge~~ of ~~this~~ ring gear R3, and thereby links ~~this~~ ring gear R3 ~~is linked~~ to the counter gear (output unit) 5. ~~via this linking unit 27.~~

As described above, the second planetary gear unit PR and the clutch C1 are located at ~~configured on~~ one axial side ~~in the direction~~ of the first ~~axis of the~~ planetary gear unit PU, whereas ~~and also~~ the clutch C2 and the clutch C3 are located ~~configured~~ on the other axial side. ~~in the direction of the axis~~. Further, the counter gear 5 is located axially ~~configured~~ between the second planetary gear unit PR and the first planetary gear unit PU. ~~in the direction of the axis.~~ Further, the first brake B2 is located radially outward ~~configured on the outer circumference side~~ of the clutch C2, and the second brake B1 is located radially outward ~~configured on the outer circumference side~~ of the first planetary gear unit PU.

Continuing~~, based on the above-mentioned construction, the~~ Operation~~s~~ of the automatic transmission ~~device~~ 1_1 will now be described, with reference ~~following~~ Fig. 1, Fig. 2, and Fig. 3. ~~below.~~ ~~Now,~~ The vertical axes of the speed line diagram illustrated in Fig. 3 show ~~indicate~~ the speed of rotation ~~revolutions~~ of each rotary ~~rotation~~ component, and the horizontal axis indicates the corresponding gear ratio of these rotary ~~rotation~~ components.

Further, ~~regarding~~ in the planetary gear unit PU section of this speed line diagram, the vertical axis ~~to the farthest horizontal edge~~ at the right side of Fig. 3 corresponds to the sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axes correspond, successively, to the ring gear R3, the carrier CR2, and the sun gear S2. ~~Further,~~ In ~~regarding~~ the planetary gear PR section of this speed line diagram (right section in Fig. 3), the vertical axis to the farthest ~~horizontal edge~~ ~~(the~~ right side of Fig. 3 corresponds to the sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axes correspond, successively, to the ring gear R1 and the carrier CR1. Further, the width between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to ~~the inverse of~~ the number of teeth of each of the ring gears R1, R3. ~~Also,~~ The dotted line ~~in a~~ horizontal ~~direction~~ within the diagram represents ~~illustrate that~~ the rotation ~~is~~ transmitted from the transmitting member 30.

As illustrated in Fig. 1, the rotation of the input shaft 2 is input to the ~~above-mentioned~~ sun gear S2, by engaging the clutch C2, and the rotation of this sun gear S2 can be stopped (braked) ~~is capable of being fixed~~ by engagement ~~retaining~~ of the brake B2 ("first brake"). The rotation of the input shaft 2 is input to the ~~above-mentioned~~ carrier CR2, by engaging the clutch C3, and this carrier CR2 can be held against ~~fix the~~ rotation by engagement ~~the retaining~~ of the

brake B2, and further, the rotation is limited to ~~in~~ one direction ~~is regulated~~ by a one-way clutch F3.

~~On the other hand,~~ The above-mentioned sun gear S1 is connected to and receives input of rotation from the input shaft 2. ~~and the rotation of this input shaft 2 is input, and further,~~ The carrier CR1 is fixed ~~connected~~ to the case 3 ~~and the rotation thereof is fixed,~~ and, therefore, the ring gear R1 rotates at a reduced speed. Further, by engaging the clutch C1, the reduced rotation of this ring gear R1 is input to the sun gear S3. ~~Also,~~ The rotation of the ~~above-mentioned~~ ring gear R3 is output to the ~~above-mentioned~~ counter gear 5, and from the counter gear 5 ~~is output~~ to the drive wheels, not illustrated, via this counter gear 5, a counter shaft unit not illustrated, and a differential unit.

In ~~At~~ first speed forward within ~~a~~ D (drive) range, as illustrated in Fig. 2, the clutch C1 and the one-way clutch F1 are engaged. Then, as illustrated in Fig. 3, the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 30. Further, the rotation of the carrier CR2 is limited to ~~controlled in~~ one direction (the forward rotation direction) by the one-way clutch F1. ~~in other words the carrier CR2 is prevented from rotating in the opposite direction and is fixed. Then,~~ The ring gear R3 rotates in ~~at~~ the forward rotation for ~~the~~ first speed forward, with ~~from~~ the reduced speed rotation input to the sun gear S3 and the fixed carrier CR2, and that rotation is output from the

counter gear 5.

~~Now, when~~ For downshifting (when coasting), the brake B1 is ~~retained and~~ engaged to fix the carrier CR2 ~~is fixed~~, and the ~~above-mentioned state of~~ first speed forward is maintained while preventing ~~the~~ forward rotation of this carrier CR2. Further, ~~at this~~ in first speed forward, the one-way clutch F1 prevents the carrier CR2 from rotation in the ~~opposite~~ reverse direction ~~and allows~~ while allowing forward rotation, and therefore, switching from a non-running range to a running range and achieving the first speed forward can be accomplished more smoothly by the automatic engaging of the one-way clutch. In this case, because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the above-mentioned transmitting member 30 ~~performs~~ transmits a relatively large torque, ~~transmission~~.

~~At~~ In second speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 ~~is engaged~~ and the brake B2 ~~is retained~~ are engaged. Then, as illustrated in Fig. 3, the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 30, and the rotation of the sun gear S2 is ~~fixed~~ stopped by the brake B2. By doing so, the carrier CR2 rotates at a slightly reduced speed ~~rotation~~, and from the reduced speed rotation input to the sun gear S3 and this slightly reduced speed rotation of the carrier CR2, the ring gear R3 is rotated ~~at~~ with the forward rotation for the second speed forward, and this rotation is output to the

counter gear 5. ~~Now, also in this case,~~ Because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the above-mentioned transmitting member 30 ~~performs~~ transmits a relatively large torque. ~~transmission.~~

~~At~~ In third speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 and the clutch C2 are engaged. Then, as illustrated in Fig. 3, the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 30, and also the rotation of the input shaft 2 is input to the sun gear S2 by engaging the clutch C2. Further, by the rotation of the input shaft 2 input to the sun gear S2 and by the decreased speed rotation of the sun gear S3, the speed of rotation of ~~fixed~~ carrier CR2 ~~has a~~ is reduced to a slightly larger ~~reduced rotation~~ extent than the reduc~~ed~~tion in rotational speed of this sun gear S3. Further, from the input rotation of the sun gear S2 and the reduced speed rotation of the sun gear S3, the ring gear R3 is rotate~~d~~ ~~at~~ with the forward rotation of ~~for~~ third speed forward, and this rotation is output from the counter gear 5. In this case also, because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the above-mentioned transmitting member 30 ~~performs~~ transmits a relatively large torque. ~~transmission.~~

~~At~~ In fourth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 and the clutch C3 are engaged. Then, as illustrated in Fig. 3, the reduced

speed rotation of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 30, and also the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C3. Then, by the rotation of input shaft 2 input to the carrier CR2 and by the reduced speed rotation of the sun gear S3, the ring gear R3 is ~~rotates~~ rotated ~~at~~ with the forward rotation ~~for~~ of fourth speed forward, and this rotation is output from the counter gear 5. In this case also, because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the ~~above-mentioned~~ transmitting member 30 ~~performs~~ transmits a relatively large torque, ~~transmission~~.

~~At~~ In fifth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C2 and the clutch C3 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the carrier CR2 via the clutch C3, and also the rotation of the input shaft 2 is input to the sun gear S2 via the clutch C2. Then, from the rotation of the input shaft 2 input to the sun gear S2, and the rotation of the input shaft 2 input to the carrier CR2, the ring gear R3 becomes ~~a~~ directly connected ~~rotation~~ and rotates ~~at the~~ with the forward rotation ~~for~~ of fifth speed forward which is at ~~has~~ the same speed ~~rotation~~ as that of the input shaft 2, and this rotation is output from the counter gear 5.

~~At~~ In sixth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C3 ~~is engaged~~ and the

brake B2 ~~is retained~~ are engaged. Then, as illustrated in Fig. 3, the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C3, and rotation of the sun gear S2 is fixed by ~~retaining~~ engagement of the brake B2. Then, from the rotation of the input shaft 2 input to the carrier CR2 ~~and from~~ with the fixed sun gear S2, the ring gear R3 rotates ~~at~~ with the overdrive rotation ~~for~~ of sixth speed forward, and this rotation is output from the counter gear 5.

~~At~~ In first speed reverse within ~~an~~ R (reverse) range, as illustrated in Fig. 2, the clutch C2 ~~is engaged~~ and the brake B1 ~~is retained~~ are engaged. Then, as illustrated in Fig. 3, the rotation of the input shaft 2 is input to the sun gear S2 by engaging the clutch C2, and also the rotation of the carrier CR2 is fixed by ~~retaining~~ engagement of the brake B1. Then, from the rotation of the input shaft 2 input to the sun gear S2 and ~~from~~ the fix~~ed~~ing of the carrier CR2, the ring gear R3 rotates in the opposite direction, i.e. as ~~the~~ first speed reverse, and this rotation is output from the counter gear 5.

~~At~~ In the P (parking) range and the N (neutral) range, ~~particularly~~ the clutch C1, clutch C2, and clutch C3 are released, the transmission ~~movement~~ of rotation between the input shaft 2 and the counter gear 5 is disconnected, and the automatic transmission ~~device~~ 1_1 as a whole is in an idle state (neutral state).

As described above, ~~according to~~ in the automatic

transmission ~~device~~ 1_1 ~~relating to~~ of the present invention, the planetary gear PR and the clutch C1 are ~~configured~~ located on one axial side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutches C2 and ~~the clutch~~ C3 are ~~configured~~ located on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU. Therefore, an automatic transmission ~~can be~~ is provided that will achieve six forward speeds and one reverse speed with direct coupling ~~at~~ in fifth speed forward. For example, compared to the case wherein the clutch C2 or clutch C3 is ~~configured~~ located between the second planetary gear unit PR and the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ located closer together, and the transmitting member 30 ~~for~~ which transmit~~ting~~s the reduced speed rotation can be made relatively short. Therefore, the automatic transmission can be made more compact and lightweight, and further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, the clutch C1 is ~~configured~~ located on one axial side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutches C2 and ~~the clutch~~ C3 are ~~configured~~ located on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU, and therefore, compared to the case wherein~~, for example, the~~ three clutches C1, C2, C3 are ~~configured~~ located on one axial side of the

first planetary gear unit PU, the construction of an oil line (for example, 2b, 92, 93, 94) ~~to~~ for provid~~e~~ing pressure oil to the ~~oil pressure~~ hydraulic servos 11, 12, and 13 for these clutches C1, C2, and C3 can be made easily, ~~and~~ the manufacturing process can be simplified, and the costs brought down.

Further, because the ~~oil pressure~~ hydraulic servo 13 is ~~provided~~ mounted on the input shaft 2, one set of ~~the~~ seal rings 82 form a seal between the case 3 and ~~supply oil to~~ the oil line 2b provided within the input shaft 2, and therefore oil can be supplied to the oil chamber "a" of the oil pressure servo 13 without providing additional seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servo 13. Further, the ~~oil pressure~~ hydraulic servos 11 and 12 can each receive supply of oil directly from the boss~~ units~~es 3a and 3b ~~provided from the case 3~~, i.e. without passing through other units. ~~for example,~~ In other words, ~~can supply oil by providing one set of seal rings 80 and 83. Therefore~~, oil can be supplied simply by providing one set of seal rings 82, 80, and 83 each for the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore, the efficiency of the automatic transmission can be improved.

Further, since ~~the~~ clutch C2 is ~~a clutch that~~ engaged ~~while at first speed reverse, when this clutch 2 is engaged~~ ~~at~~ in first speed reverse, the transmitting member 30 rotates in ~~a~~ reverse ~~rotation~~, and while the hub unit 24 that

connects this clutch C2 and the sun gear S2 has the same rotational speed as the input shaft 2, ~~by engaging this clutch C2~~, there may be cases wherein the rotational difference ~~of the~~ speeds between transmitting member 30 and the hub unit 24 becomes large, but because ~~this~~ clutch C2 is located on the ~~opposite~~ side of opposite ~~of~~ the second planetary gear PR unit, ~~via~~ the first planetary gear unit PU, the transmitting member 30 and the hub unit 24 can be located ~~configured~~ apart from one another. Compared to the case wherein, for example, those parts come in contact due to a multi-axial construction, the loss of ~~decreased~~ efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is located ~~configured in the~~ axially ~~direction~~ between the planetary gear unit PU and the planetary gear PR, the counter gear 5 can be located ~~configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted in ~~on~~ the vehicle, enlargement ~~ing~~ toward ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side from the drive source is the front direction) can be prevented because the counter gear 5 is mounted to mate with ~~match~~ the drive wheel transmission mechanism. Because of this, particularly in the case of a~~n~~ FF vehicle, the interference with ~~toward~~ the front wheels is reduced, and the mountability on a vehicle can be improved. ~~such~~ The steering

angle ~~being~~ is greatly improved, for example.

~~Further,~~ Because the automatic transmission ~~device 1_1 according to~~ the present embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward, ~~Therefore, at~~ in first speed forward or fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ more precisely set for efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated at a lower speed, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

Second Embodiment

The second embodiment, which is a partial modification of the first embodiment, will be described with reference to Fig. 4. ~~Fig. 4 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the second embodiment. Now,~~ Components of the second embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for ~~partial modifications~~ those components which are modified.

As Fig. 4 illustrates, the automatic transmission ~~device~~ 1_2 of the ~~automatic transmission relating to the~~ second embodiment has the input side and output side ~~backwards~~ reversed from that of the automatic transmission ~~device~~ 1_1

~~of the automatic transmission~~ of the first embodiment (see Fig. 1). Further, the ~~actions~~ operations of ~~the~~ first speed forward through the sixth speed forward and the first speed reverse ~~is~~ are similar (see Fig. 2 and Fig. 3).

Accordingly, ~~and~~ similar to the first embodiment, ~~according to~~ in the automatic transmission device 1_2 ~~relating to the present invention~~ of the second embodiment, the planetary gear unit PR and the clutch C1 are ~~configured~~ located on one axial side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 and the clutch C3 are ~~configured~~ located on the other side ~~in the~~ axial ~~direction~~ of the first planetary gear unit PU, and therefore directly coupled when at fifth speed forward, and can achieve six forward speeds and one reverse speed. In this second embodiment also, ~~T~~the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ located closer together, compared to the case wherein, for example, the clutch C2 and the clutch C3 are ~~configured~~ located between the planetary gear PR and the planetary gear unit PU, and the transmitting member 30 ~~for~~ which transmit~~ting~~s the reduced speed rotation can be made relatively short. Therefore, the automatic transmission can be made compact and lightweight, and further, because the inertia ~~(force of inertia)~~ can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, the clutch C1 is ~~configured~~ located on one axial side ~~in the~~

~~axial direction~~ of the planetary gear unit PU, and the clutch C2 and the clutch C3 are ~~configured~~ located on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU, and therefore, compared to the case wherein, for example, the three clutches C1, C2, and C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the ~~construction of an~~ oil line (for example, 2b, 92, 93, 94) ~~to~~ for providing oil to the ~~oil pressure~~ hydraulic servos 11, 12, and 13 for ~~these~~ operating clutches C1, C2, and C3 can be ~~made~~ constructed easily, ~~and~~ i.e. the manufacturing process ~~can be~~ is simplified and the costs ~~brought down~~ reduced.

Further, because the ~~oil pressure~~ hydraulic servo 13 is provided on the input shaft 2, one set of the seal rings 82 ~~seal the case 3~~ form connection of oil line 93 in boss 3b and supply oil to the oil line 2b provided within input shaft 2, and therefore oil can be supplied to the oil chamber "a" of the oil pressure servo 13 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servo 13. Further, the ~~oil pressure~~ hydraulic servos 11 and 12 can each receive supply of oil directly from the boss units 3a and 3b provided from the case 3, i.e. without passing through other units. ~~for example,~~ In other words, their ~~can~~ supply of oil can be secured by providing one set of ~~the~~ seal rings 80 and 83. Therefore, oil can be supplied simply by providing one set of ~~the~~ seal rings 82, 80, and 83 each for the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic

transmission can be improved.

Further, ~~since the clutch C2 is a clutch that~~ engaged ~~while at first speed reverse, when this~~ with clutch ~~C2 is~~ C2 engaged ~~at~~ in first speed reverse, there may be a large difference in rotational speed ~~case may occur wherein the~~ between the transmitting member 30 which rotates in ~~a~~ reverse ~~rotation,~~ and ~~on the other hand~~ the hub unit 24 that connects this clutch C2 and the sun gear S2 and which has the same rotation as the input shaft 2 ~~by engaging this clutch C2, and there may be cases wherein the rotation difference of the transmitting member 30 and the hub unit 24 becomes large, but~~ However, because this clutch C2 is located on the opposite ~~side of~~ the second planetary gear unit PR, ~~and~~ side of the planetary gear unit PU, the transmitting member 30 and the hub unit 24 can be ~~configured~~ located apart from one another. Compared to the case wherein, for example, those parts come in contact due to a multi-axial construction, the decreased efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is located ~~configured in the~~ axially ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be located ~~configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on the vehicle, enlargement ~~ing~~ towards ~~one direction of the axis (particularly in~~ the rear

~~direction~~ (when the input side from the drive source is the front ~~direction~~) is not required ~~can be prevented~~ because the counter gear 5 is mounted to mate with ~~match~~ the drive wheel transmission mechanism. Because of this, particularly in the case of an FF vehicle, the interference with ~~toward~~ the front wheels is reduced, ~~and~~ the mountability on a vehicle is ~~can be~~ improved, and ~~such~~ the steering angle is ~~being~~ greatly improved. ~~for example.~~

Further, the automatic transmission ~~device~~ 1_2 according to the second ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled in ~~at~~ fifth speed forward. Therefore, in ~~at~~ first speed forward or fourth speed forward, the gear ratio can be set more precisely ~~specified in a detailed manner~~, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be operated at lower ~~utilized with~~ speeds ~~better revolutions~~, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

Third Embodiment

The third embodiment, which is a partial modification of the first embodiment will now be described with reference to Fig. 5 through Fig. 7. ~~Fig. 5 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the third embodiment, Fig. 6 is a operational table of an automatic transmission relating to the third embodiment, and Fig. 7 is~~

~~a speed line diagram of an automatic transmission relating to the third embodiment. Now,~~ Components of the third embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for components which are partially modifi~~cations~~ed.

As Fig. 5 illustrates, the automatic transmission ~~device~~ 1_3 of the ~~automatic transmission relating to the~~ third embodiment has a modified ~~configuration of the~~ planetary gear unit PR and modified ~~the~~ clutch C1, and further, a modified ~~construction of the~~ oil line for supplying ~~of the~~ oil pressure to hydraulic servo 11 of the clutch C1, as compared to ~~that of~~ the automatic transmission ~~device~~ 1_1 of the ~~automatic transmission of the~~ first embodiment (see Fig. 1).

Within the automatic transmission ~~device~~ 1_3, the clutch C1 is located ~~configured~~ on the side of the planetary gear unit PR ~~, on the~~ opposite ~~side (right side on the diagram) from~~ the planetary gear unit PU. The ~~front edge of the~~ inner circumferential surface of ~~circumference side of~~ the drum ~~shaped member~~ 21 of ~~this~~ clutch C1 is splined to the friction plates 71 ~~, and the inner circumference side of this friction plate 71 is~~ which are intermeshed with friction plates splined to the hub unit 22. The drum ~~shaped member~~ 21 is connected to the input shaft 2, and the hub unit 22 is connected to the sun gear S1 of the second planetary gear unit PR. The side plate of the carrier CR1 of this planetary gear PR is fixed to and supported by the case 3.

Also, the ring gear R1 is connected to the transmitting member 30, and this transmitting member 30 is connected to the sun gear S3. In other words, the ring gear R1 and the sun gear S3 are constantly connected ~~in contact~~ with one another, ~~for example~~ with no clutch located there between, and ~~the~~ rotation can constantly be transmitted.

The oil compartment of this oil pressure servo 11 is linked to an oil line 2a which is formed in ~~on~~ the input shaft 2, and this oil line 2a is ~~provided along one edge of the case 3, and is~~ connected to the oil line 91 in ~~of~~ the boss ~~unit~~ 3a which surrounds ~~is provided on~~ the input shaft 2 in the form of a sleeve, and this oil line 91 is linked to an oil pressure control unit not illustrated. Therefore, ~~regarding the above-mentioned oil pressure servo 11~~, simply by providing one set of the seal rings 81 to form seal between the input shaft 2 and the boss ~~unit~~ 3a ~~of the case 3~~, an oil line is established ~~constructed~~ between ~~from~~ the oil pressure control device (not illustrated) and ~~to~~ the oil compartment of the hydraulic ~~oil pressure~~ servo 11.

~~Continuing, based on the above-mentioned construction,~~ The operations of the automatic transmission ~~device~~ 1_3 of the third embodiment will now be described with reference to ~~following~~ Fig. 5, Fig. 6, and Fig. 7. ~~below.~~ ~~Now,~~ Similar to the above-described first embodiment, the vertical axes ~~axis~~ of the speed line diagram illustrated in Fig. 7 indicate~~s~~ the rotational speeds ~~revolutions~~ of each rotary ~~rotation~~ component, and the horizontal axis indicates the corresponding gear ratio

of these ~~rotation~~ rotary components. Further, ~~regarding~~ in the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right ~~side of~~ in Fig. 7~~)~~ corresponds to the sun gear S3, and ~~thereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes correspond~~s~~ to the ring gear R3, the carrier CR2, and the sun gear S2. Further, ~~regarding~~ in the second planetary gear unit PR section of ~~this~~ the speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right ~~side of~~ in Fig. 7~~)~~ corresponds to the sun gear S1, and ~~thereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes correspond~~s~~ in succession to the ring gear R1 and the carrier CR1. Further, the ~~width~~ distances between these vertical axes are proportional ~~to the~~ inversely ~~of~~ to the number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, the dotted line ~~in a~~ horizontal ~~direction~~ within the diagram ~~illustrate that~~ represents the rotation ~~is~~ transmitted ~~from~~ by the transmitting member 30.

As illustrated in Fig. 5, by engaging the clutch C1, the rotation of the input shaft 2 is input to the sun gear S1. Further, the rotation of the above-mentioned carrier CR1 is fixed to the case 3, and the ~~above-mentioned~~ ring gear R1 is rotated at a decrease~~d~~ speed ~~rotation~~ based on the rotation of the input shaft 2 input to ~~this~~ the sun gear S1. In other words,

by engaging the clutch C1, the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 30.

Then, as illustrated in Fig. 6 and Fig. 7, within the second planetary gear unit PR, ~~at~~ in first speed forward, second speed forward, third speed forward, and fourth speed forward, the rotation of the input shaft 2 is input to the sun gear S1 by engaging the clutch C1, ~~the~~ reduced speed rotation is output to the ring gear R3 from the fixed carrier CR1, and the reduced speed rotation is input to the sun gear S3 via the transmitting member 30. At this time, the ring gear R1 and the sun gear S3 are rotating at a reduced speed, and therefore the ~~above-mentioned~~ transmitting member 30 ~~performs~~ transmits a relatively large torque ~~transmission~~. On the other hand, ~~at~~ in fifth speed forward, sixth speed forward, and first speed reverse, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, and further, because the clutch C1 is released, as illustrated in Fig. 7, the sun gear S1 rotates based on ~~each different~~ the speed ~~level of this~~ of the ring gear R1 and ~~the fixed~~ fixing of the carrier CR1.

~~Now,~~ The ~~actions~~ operations of the ~~above-mentioned~~ planetary gearing are similar to those of the ~~above-described~~ first embodiment, ~~except for~~ other than those of the above-described second planetary gear unit PR (see Fig. 2 and Fig. 3), and accordingly, description thereof will be omitted.

As described above, ~~according to~~ in the automatic transmission ~~device~~ 1_3 of the third embodiment ~~relating to the present invention~~, the planetary gear PR and the clutch C1 are ~~configured~~ located on one side ~~in the~~ axial ~~direction~~ of the first planetary gear unit PU, and the clutch C2 and the clutch C3 are ~~configured~~ located on the other side ~~in the~~ axial ~~direction~~ of the first planetary gear unit PU. Therefore, ~~an~~ the automatic transmission of the third embodiment ~~can be provided that~~ will achieve six forward speeds and one reverse speed, with direct coupling at the fifth speed forward. For example, compared to the case wherein the clutch C2 or clutch C3 is ~~configured~~ located between the second planetary gear unit PR and the first planetary gear unit PU, in the third embodiment the second planetary gear unit PR and the planetary gear unit PU can be ~~configured~~ located closer together, and the transmitting member 30 ~~for~~ which transmit~~ting~~s the reduced speed rotation can be made relatively shorter. Therefore, the automatic transmission of the third embodiment can be made more compact and lightweight, and further, because the inertia (interial force ~~of inertia~~) can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, the clutch C1 is ~~configured~~ on one axial side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 and the clutch C3 are ~~configured~~ located on the other axial side ~~in the axial direction~~ of the planetary gear unit PU, and therefore, compared to the case wherein, for example, the

three clutches C1, C2, and C3 are ~~configured~~ located on one side of the planetary gear unit PU, the construction of an oil line (for example, 2a, 2b, 91, 93, 94) ~~to provide oil to the~~ for providing oil pressure to the hydraulic servos 11, 12, and 13 for these clutches C1, C2, and C3 can be made more easily, ~~and~~ the manufacturing process can be simplified, and the costs ~~brought down~~ can be reduced.

Further, because the ~~oil pressure~~ hydraulic servos 11 and 13 are provided on the input shaft 2, one set of the seal rings 81 and 82 seal provided between the bosses 3a and 3b of the case 3 and ~~the case 3 and supply oil to~~ the oil lines 2a, and 2b provided within the input shaft 2, and therefore oil can be supplied to the oil compartments of the ~~oil pressure~~ hydraulic servos 11 and 13 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 13. Further, the ~~oil pressure~~ hydraulic servo 12 can be directly ~~supply~~ supplied with oil from the boss ~~unit~~ 3b ~~provided from the case 3~~, i.e. without passing through other units for example. In other words, ~~can~~ the supply as oil can be established by providing one set of the seal rings 83. Therefore, oil can be supplied simply by providing ~~one~~ sets of ~~the~~ seal rings 81 and 82, 83 ~~each~~ for the respective oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, ~~the clutch C2 is a clutch that engages while at the first speed reverse, therefore~~ when ~~this~~ clutch C2 is engaged ~~at the~~ in first speed reverse 2nd the transmitting member

30 rotates in ~~a~~ reverse ~~rotation~~, ~~while~~ there may be cases wherein by engaging ~~this~~ clutch C2, the hub unit 24 connecting this clutch C2 and the sun gear S2 will rotates at the speed ~~rotation~~ of the input shaft 2, and some cases may occur wherein the ~~revolution~~ difference in rotational speeds between the transmitting member 30 and the hub unit 24 may be large. However, because this clutch C2 is located on the ~~opposite~~ side of opposite the planetary gear PR ~~via~~ the planetary gear unit PU, that is to say, the transmitting member 30 and the hub unit 24 can be ~~configured~~ spaced apart, ~~and~~ compared with a construction ~~the case~~ wherein ~~for example~~ those units are ~~configured~~ in contact with a multi-axial construction, the ~~decreased~~ loss of efficiency of the automatic transmission produced by friction resulting from the relative rotation between those units can be prevented.

Further, because the counter gear 5 is located ~~configured in the~~ axially ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be located ~~configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. ~~For example~~ Thus, when the automatic transmission is mounted on the vehicle, enlargment ~~ing~~ toward~~s~~ ~~one direction of the axis (particularly in~~ the rear ~~direction~~ when the input side from the drive source is the front ~~direction~~) ~~can be prevented~~ is not required because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission mechanism. Because of this, particularly in the case of a~~n~~ FF vehicle,

~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle ~~can be~~ is improved, ~~such~~ and the steering angle ~~being~~ is greatly improved. ~~for example.~~

Further, the automatic transmission ~~device~~ 1_3 ~~according to~~ of the ~~present~~ third embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ more precisely set for best efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed can be ~~utilized with better revolutions~~ reduced, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

~~In order to solve the above-described problems, proposals have been made~~ such ~~as those in~~ Japanese Unexamined Patent Application Publication No. 8-68456, discloses a transmission ~~However, the product in this Publication has a construction~~ wherein a clutch is ~~configured on~~ located in the power path of ~~line that transmits the~~ reduced speed rotation transfer from ~~of~~ the speed reducing planetary gear unit to the ~~rotation~~ rotary component of the first planetary gear unit, and because this power path ~~the line that~~ transmits this reduced speed rotation ~~is a line wherein a large~~ with high torque ~~is input~~, the clutch or members within the power path that transmits the high torque must be constructed so as to withstand this ~~large~~ high torque. Further, the member(s) constituting the power path ~~line~~ for transmitting this reduced speed rotation ~~is a part for~~ ~~rotating~~ rotate at a high speed, for

example, when ~~at~~ in sixth speed forward, and therefore, as in the above-mentioned Publication, in the event that the ~~construction~~ transmission member(s) links the drum of the clutch to the ~~rotation~~ input rotary component of the first planetary gear unit, controllability is lost when engaging and releasing this clutch because the drum unit changes shape because of the centrifugal force ~~due to the~~ generated at high ~~revolutions~~ speed. Therefore, it is an object of the present invention to provide an automatic transmission wherein the controllability of the clutch ~~is not lost~~ utilized as a reduced rotation output means, is not lost even at ~~a~~ high speed ~~revolution~~ rotation of the ~~rotation~~ rotary component of the first planetary gear unit.

~~Further, according to~~ In the automatic transmission ~~device~~ 1_3 ~~according to~~ of the ~~present~~ third embodiment, the clutch C1 ~~links~~ connects/disconnect the input shaft 2 and the sun gear S1 ~~so as to be capable of disengaging,~~ and, therefore, compared ~~with~~ for example, with a transmission ~~the case~~ wherein the clutch C1 ~~makes~~ connects/disconnects the ring gear R1 and the sun gear S3 ~~capable of disengaging~~, the load on the clutch C1 is less, ~~can be reduced~~, ~~and can prevent the~~ loss of controllability of the clutch C1 is prevented, and further, the clutch C1 can be made more compact.

Further, the drum ~~-shaped member~~ 21 of the clutch C1 is linked to the input shaft 2, and the hub unit 22 is linked to the sun gear S1 of the first planetary gear unit PR, and therefore, the hub unit 22 which has a smaller diameter than the clutch drum ~~21~~

~~shaped member~~ 21 can be linked, for example, with the sun gear S1 that rotates at a high ~~revolution~~ speed when ~~at~~ in sixth speed forward. ~~and~~ Thus, compared to the case wherein the sun gear S1 is linked to the clutch drum~~/shaped member~~, in this third embodiment, the centrifugal force can be reduced, and ~~the decrease of~~ reduction of controllability of the clutch C1 when engaging and releasing can be prevented.

~~[~~Fourth Embodiment~~]~~

The fourth embodiment, which is a partial modification of the third embodiment will be described~~,~~ with reference to Fig. 8. ~~Fig. 8 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the fourth embodiment.~~ ~~Now,~~ Components of the fourth embodiment which are the same as those of the third embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for the ~~partial~~ modifi~~cations~~ed components.

As Fig. 8 illustrates, the automatic transmission ~~device~~ 1_4 of the ~~automatic transmission relating to the~~ fourth embodiment has a modified ~~configuration of the~~ second planetary gear unit PR and ~~the~~ clutch C1, ~~compared to that~~ i.e. modification of the automatic transmission ~~device 1_3 of the automatic transmission~~ of the third embodiment (see Fig. 5).

With the automatic transmission ~~device~~ 1_4, the clutch C1 is disposed axially between the second planetary gear unit PR and the first planetary gear unit PU ~~in the axial direction~~, specifically between

the second planetary gear unit PR and the counter gear 5. The drum ~~shaped member~~ 21 is connected to one end of the input shaft 2 (at the upper right side in the drawing), and the friction plates 71 of the clutch C1, which ~~is capable of~~ are engag~~ing by~~ed under control of the clutch C1 ~~oil pressure~~ hydraulic servo 11, ~~is disposed by~~ are splin~~ing~~ed ~~at~~ to the inner circumferen~~ce side of~~tial surface at the front end of the drum ~~shaped member~~ 21 and are intermeshed with ~~. On the inner circumference side of the~~ friction plates ~~71 of this clutch C1 is configured~~ splined to a hub unit 22 ~~by being splined~~, and this hub unit 22 is connected to the sun gear S1 of the second planetary gear unit PR.

The carrier CR1 of the second planetary gear unit PR ~~has the pinion Pa and the pinion Pb, the~~ carries a pinion Pb which meshes with the above-mentioned ring gear R1, and ~~the~~ a pinion Pa which meshes with the sun gear S1 which is connected to the hub unit 22. The carrier CR1 is fixed to the case 3 through the side plate, and the ring gear R1 is connected with the transmitting member 30. The sun gear S3 of the first planetary gear unit PU is connected to the other ~~side~~ end of the transmitting member 30.

Also, the oil chamber "a" of the ~~oil pressure~~ hydraulic servo 11 of the clutch C1 communicates with the oil path 2a of the input shaft 2, and the oil path 2a communicates with an ~~unshown~~ oil pressure control device through the oil path 91 of the boss 3a. In other words, because the ~~above mentioned~~ ~~oil pressure~~ hydraulic servo 11 is ~~configured~~ mounted on the input shaft 2, an oil ~~line~~ path from the oil pressure control unit ~~not illustrated~~

to the oil chamber "a" of the oil pressure servo 11 is constructed by one set of seal rings 81 which provides a ~~to~~ seal between this boss ~~unit~~ 3a and the input shaft 2.

The operations of the automatic transmission ~~device~~ 1_4 of this fourth embodiment ~~according to the above configuration~~ are the same as those of the third embodiment (see Fig. 6 and Fig. 7), and accordingly description thereof will be omitted.

As described above, in ~~according to~~ the automatic transmission ~~device~~ 1_4 of the fourth embodiment ~~relating to the present invention~~, the second planetary gear unit PR and the clutch C1 are located ~~configured~~ on one axial side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 and the clutch C3 are located ~~configured~~ on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU. The ~~Therefore, an~~ automatic transmission of the fourth embodiment ~~can be~~ provides ~~that will achieve~~ six forward speeds and one reverse speed, with direct coupling in ~~at the~~ fifth speed forward. For example, compared to a transmission ~~the case~~ wherein the clutch C2 or clutch C3 is located ~~configured~~ between the planetary gear unit PR and the first planetary gear unit PU, in this fourth embodiment the second planetary gear PR and the first planetary gear unit PU can be located ~~configured~~ closer together, and the transmitting member 30 which ~~for~~ transmits ~~transmitting~~ the reduced speed rotation can ~~be~~ made relatively shorter. Therefore, the automatic transmission can be made more compact and lightweight, and further, because the inertia inertial (force ~~of~~) ~~inertia~~ can be reduced, the controllability of the

automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, the clutch C1 is located ~~configured~~ on one axial side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 and the clutch C3 are located ~~configured~~ on the other axial side ~~in the axial direction~~ of the planetary gear unit PU. Therefore compared to a transmission ~~the case~~ wherein, for example, the three clutches C1, C2, and C3 are located ~~configured~~ on one axial side of the planetary gear unit PU, the construction of an oil line (for example, 2a, 2b, 91, 93, 94) to provide oil to the ~~oil~~ hydraulic ~~pressure~~ servos 11, 12, and 13 which operate, respectively, ~~for these~~ clutches C1, C2, and C3 can be made easily, ~~and~~ the manufacturing process can be simplified and the costs reduced ~~brought down~~.

between

Further, because the hydraulic ~~oil pressure~~ servos 11 and 13 are ~~provided~~ on the input shaft 2, one set of the seal rings 81 and 82 provide a seal ~~s~~ the case 3 and ~~supply oil to the~~ oil lines 2a, and 2b provided within the input shaft 2, and therefore oil can be supplied to the oil compartments of the hydraulic ~~oil pressure~~ servos 11 and 13 without providing seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 11 and 13. Further, the hydraulic ~~oil pressure~~ servo 12 can receive supply of oil directly from the boss ~~unit~~ 3b ~~provided from the case 3~~ without passing through other units ~~for example~~. In other words, an ~~can~~ supply oil paths are established by providing one set of ~~the seal rings 83~~.

~~Therefore, oil can be supplied simply by providing one set~~

of ~~the~~ seal rings 81 and 82, 83 each for the hydraulic ~~oil pressure~~ servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, when ~~since~~ the clutch C2 is ~~a clutch that~~ engaged in ~~while at~~ first speed reverse, ~~when this clutch 2 is engaged at first speed reverse~~, the transmitting member 30 rotates in ~~a~~ reverse ~~rotation, and while~~, the hub unit 24 that connects this clutch C2 and the sun gear S2 has the same rotation as the input shaft 2 ~~by engaging this clutch C2~~, and there may be a large ~~cases wherein the~~ rotational difference in speeds of the transmitting member 30 and the hub unit 24, ~~becomes large~~, However, ~~but~~ because this clutch C2 is located on the ~~opposite~~ side opposite ~~of~~ the second planetary gear unit PR, of ~~via~~ the planetary gear unit PU, the transmitting member 30 and the hub unit 24 can be spaced ~~configured~~ apart from one another. Compared to the case wherein, for example, those parts come in contact due to a multi-axial construction, the decrease~~d~~ in efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is located ~~configured in the~~ axially ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be located ~~configured~~ in approximately the axial center ~~in the axial direction~~ of the automatic transmission. ~~For example,~~ When the automatic

transmission is mounted on the vehicle, enlarg~~ing~~ment toward~~s~~ ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side from the drive source is the front ~~direction~~) ~~can be prevented~~ is unnessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission mechanism. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ is improved, ~~such~~ and the steering angle ~~being~~ is greatly improved. ~~for example.~~

Further, the automatic transmission ~~device~~ 1_4 ~~according~~ ~~to~~ in the ~~present~~ fourth embodiment is also ~~a transmission device that is~~ directly coupled at fifth speed forward. Therefore, ~~at~~ in first speed forward or fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ more precisely set for maximum efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed can be ~~utilized with better revolutions~~ reduced, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

~~In order to solve the above-described problems, proposals have been made such as those in Japanese Unexamined Patent Application Publication No. 8-68456. However, the product in this Publication has a construction wherein a clutch is configured on the line that transmits the reduced rotation of the reducing planetary gear to the~~

rotation component of the planetary gear unit, and because the line that transmits this reduced rotation is a line wherein a large torque is input, the clutch or members that transmit the torque must be constructed so as to withstand this large torque. Further, the line for transmitting this reduced rotation is a part for rotating at a high speed for example when at sixth speed forward, and therefore, as in the above-mentioned Publication, if the construction links the drum of the clutch to the rotation component of the planetary gear unit, controllability is lost when engaging and releasing this clutch because the drum unit changes shape because of the centrifugal force due to the high revolutions. Therefore, it is an object of the present invention to provide an automatic transmission wherein the controllability of the clutch is not lost as a reduced rotation output means, even at a high speed revolution of the rotation component ~~of the planetary gear unit.~~

~~Further, according to~~ In the automatic transmission ~~device~~ 1~~4~~ according to the ~~present~~ fourth embodiment, the clutch C1 ~~links~~ selectively connects/disconnects the input shaft 2 and the sun gear S1. ~~so as to be capable of disengaging,~~ Therefore, compared with, for example, ~~the case~~ a transmission wherein the clutch C1 ~~makes~~ connects the ring gear R1 and the sun gear S3 ~~capable of disengaging~~, the load on the clutch C1 can be reduced, ~~and can prevent the loss of~~ reduction in control~~ability~~ is prevented of the clutch C1, and further, the clutch C1 can be made

more compact.

Further, the drum~~-shaped member~~ 21 of the clutch C1 is linked to the input shaft 2, and the hub unit 22 is linked to the sun gear S1 of the second planetary gear unit PR, and therefore, the hub unit 22 which has a smaller diameter than the drum~~-shaped member~~ 21 can be linked for example with the sun gear S1 that rotates at a high ~~revolution~~ speed when ~~at~~ in sixth speed forward~~s~~ and, compared to the case wherein the sun gear S1 is linked to the drum~~-shaped member~~, the centrifugal force can be reduced, and ~~the decrease~~ reduction of controllability of the clutch C1 ~~when engaging and releasing~~ can be prevented.

Fifth Embodiment

The fifth embodiment, which is a partial modification of the third embodiment will now be described~~,~~ with reference to Fig. 9. ~~Fig. 9 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the fifth embodiment.~~ ~~Now,~~ Components of the ~~fourth~~ fifth embodiment which are the same as those of the third embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for ~~partial~~ the modifi~~cations~~ed components.

As Fig. 9 illustrates, the automatic transmission ~~device~~ 1_5 of the ~~automatic transmission relating to the~~ fifth embodiment has ~~a configuration wherein the~~ clutch C1 ~~is configured~~ mounted on the boss ~~unit~~ 3a, rather than on the input

shaft 2, and in this respect differs from ~~compared to~~ the automatic transmission ~~device~~ 1_3 of ~~the automatic transmission of~~ the third embodiment (see Fig. 5).

~~With~~ In the automatic transmission ~~device~~ 1_5 of the sixth embodiment, the clutch C1 is disposed on the ~~opposite~~ side of opposite the planetary gear unit PU ~~as to~~ the second planetary gear unit PR (to the right in the drawing). The drum ~~-shaped member~~ 21 is ~~disposed~~ rotatably supported on the boss ~~unit~~ 3a extending from the case 3, and the inner circumferential surface at ~~side of~~ the front end of the drum ~~-shaped member~~ 21 of the clutch C1 is connected to the input shaft 2. ~~Also,~~ The friction plates 71 ~~is disposed by~~ are splined to ~~splining at~~ the inner circumferential surface, at ~~side of~~ the front end of the drum ~~-shaped member~~ 21, and are intermeshed with ~~on the inner circumference side of the~~ friction plates ~~71 of this clutch C1 is~~ splined to the hub unit 22 connected to the sun gear S1 of the second planetary gear unit PR.

The carrier CR1 of the second planetary gear unit PR has ~~the pinion Pa and the pinion Pb, the~~ pinion Pb which meshes with the ~~above-mentioned~~ ring gear R1, and ~~the~~ pinion Pa which meshes with the sun gear S1 ~~which is~~ connected to the hub unit 22. The carrier CR1 is fixed to the case 3 through ~~the~~ a side plate, and the ring gear R1 is connected ~~with~~ to one end of the transmitting member 30. The sun gear S3 of the first planetary gear unit PU is connected to the other ~~side~~ end of the transmitting member 30.

~~Also,~~ The oil chamber "a" of the ~~oil pressure~~ hydraulic servo 11 of the clutch C1 communicates with the oil path 91 ~~of~~ in the

boss ~~unit~~ 3a, and the oil path 91 communicates with an unshown oil pressure control device. In other words, because the hydraulic ~~above-mentioned oil pressure~~ servo 11 is mounted ~~configured~~ on the boss ~~unit~~ 3a, an oil supply path ~~line~~ from the oil pressure control unit ~~not illustrated~~ to the oil chamber "a" of the hydraulic ~~oil pressure~~ servo 11 is constructed with ~~by~~ one set of seal rings 81 which provides a ~~to~~ seal between the boss ~~unit~~ 3a and the hydraulic ~~oil pressure~~ servo 11.

The operations of the automatic transmission ~~device~~ 1_5 of the fifth embodiment ~~according to the above configuration~~ are the same as those of the third embodiment (see Fig. 6 and Fig. 7), and accordingly, description thereof will be omitted.

As described above, in ~~according to~~ the automatic transmission ~~device~~ 1_5 of the fifth embodiment ~~relating to the present invention~~, the second planetary gear unit PR and the clutch C1 are located ~~configured~~ on one axial side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 and the clutch C3 are located ~~configured~~ on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU. The ~~Therefore, an~~ automatic transmission of the fifth embodiment ~~can be~~ provides ~~provided~~ ~~that will achieve~~ six forward speeds and one reverse speed, with direct coupling in ~~at the~~ fifth speed forward. In this fifth embodiment also, ~~For example,~~ compared to the case wherein the clutch C2 or clutch C3 is located ~~configured~~ between the second planetary gear unit PR and the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be located ~~configured~~ closer

together, and the transmitting member 30 for transmitting the reduced speed rotation can be made relatively shorter. Therefore, the automatic transmission can be made more compact and lightweight, and further, because the inertia (internal force) ~~of inertia)~~ can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Because ~~Further,~~ the clutch C1 is located ~~configured~~ on one axial side of ~~in the~~ ~~axial direction~~ of the first planetary gear unit PU, and the clutch C2 and the clutch C3 are located ~~configured~~ on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU, ~~therefore~~ compared with ~~to~~ the case wherein ~~, for example,~~ the three clutches C1, C2, and C3 are located ~~configured~~ on one axial side of the first planetary gear unit PU, the construction of an oil supply path ~~line~~ (for example, 2a, 2b, 91, 93, 94) for ~~to~~ providing oil to the ~~oil pressure~~ hydraulic servos 11, 12, and 13 ~~for these clutches C1, C2, and C3~~ can be made more easily, ~~and~~ the manufacturing process can be simplified and the costs brought down.

Further, because the hydraulic ~~oil pressure~~ servos 11 and 13 are mounted ~~provided~~ on the input shaft 2, ~~one set of~~ the sets of seal rings 81 and 82 seal the bosses 3a and 3b respectively ~~case 3 and supply oil~~ to the oil lines 2a, and 2b provided within the input shaft 2, and therefore oil can be supplied to the respective oil compartments of the hydraulic ~~oil pressure~~ servos 11 and 13 without providing seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 11

and 13. Further, the hydraulic ~~oil pressure~~ servo 12 can be suppl~~y~~ied oil from the boss unit 3b extending ~~provided~~ from the case 3, without that supply passing through other units or ~~for example~~, in other words, can be established ~~supply oil~~ by providing one set of the seal rings 83. Therefore, an oil path can be established ~~supplied~~ simply by providing one set of ~~the~~ seal rings 81 and 82, 83 each of for the hydraulic ~~oil pressure~~ servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, when ~~since the~~ clutch C2 is ~~a clutch that~~ engaged in ~~while at~~ first speed reverse, ~~when this clutch 2 is engaged at first speed reverse,~~ the transmitting member 30 rotates with ~~in a~~ reverse rotation, and while the hub unit 24 that connects this clutch C2 and the sun gear S2 has the same rotation as the input shaft 2 due to engagement of ~~by engaging this~~ clutch C2, ~~there may be cases wherein the rotation~~ the difference between rotational speeds of the transmitting member 30 and the hub unit 24 may be ~~becomes~~ large. However ~~but~~ because this clutch C2 is located on the ~~opposite~~ side opposite second ~~of~~ the planetary gear unit PR, of ~~via~~ the planetary gear unit PU, the transmitting member 30 and the hub unit 24 can be spaced ~~configured~~ apart from one another. Compared to the case wherein, for example, those parts come in contact due to a multi-axial construction, the decreased efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is ~~configured in~~ located ~~the~~ axial~~direction~~ly between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ positioned in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. ~~For example, when the automatic~~ In this manner transmission ~~is mounted on the vehicle~~, enlarg~~ing~~ement of the transmission towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side ~~from~~ facing the drive source is the front ~~direction~~) ~~can be prevented~~ is not necessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission mechanism. Because of this, particularly in the case of a~~n~~ FF vehicle, the interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle ~~can be~~ is improved, ~~such~~ and the steering angle ~~being~~ is greatly improved, for example.

Further, because the automatic transmission ~~device~~ ~~14~~ 15 according to the ~~present~~ fifth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward~~. Therefore, at~~ in first speed forward or fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ more precisely set for efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

~~In order to solve the above-described problems,~~

~~proposals have been made such as those in Japanese Unexamined Patent Application Publication No. 8-68456. However, the product in this Publication has a construction wherein a clutch is configured on the line that transmits the reduced rotation of the reducing planetary gear to the rotation component of the planetary gear unit, and because the line that transmits this reduced rotation is a line wherein a large torque is input, the clutch or members that transmit the torque must be constructed so as to withstand this large torque. Further, the line for transmitting this reduced rotation is a part for rotating at a high speed for example when at sixth speed forward, and therefore, as in the above-mentioned Publication, if the construction links the drum of the clutch to the rotation component of the planetary gear unit, controllability is lost when engaging and releasing this clutch because the drum unit changes shape because of the centrifugal force due to the high revolutions. Therefore, it is an object of the present invention to provide an automatic transmission wherein the controllability of the clutch is not lost as a reduced rotation output means, even at a high speed revolution of the rotation component of the planetary gear unit.~~

Further, ~~according to~~ in the automatic transmission ~~device~~ 1_5 ~~according to~~ of the ~~present~~ sixth embodiment, the clutch C1 ~~links~~ engages/disengages the input shaft 2 and the sun gear S1 ~~so as to be capable of~~

and ~~disengaging~~, therefore, compared with, for example, the case wherein the clutch C1 engages/disengages ~~makes~~ the ring gear R1 and the sun gear S3 ~~capable of disengaging~~, the load on the clutch C1 is ~~can be~~ reduced, ~~and can prevent the loss of~~ controllability of the clutch C1 is retained, and further, the clutch C1 can be made more compact.

Further, the clutch C1 is mounted ~~configured~~ on the boss ~~unit~~ 3a wherein the oil path 91 from the oil pressure control device is formed, and accordingly, the automatic transmission 15 can be can be made more axially compact ~~in the axial direction~~ as compared with the case wherein the clutch C1 is mounted ~~configured~~ on the input shaft 2, for example (see Fig. 5).

Further, the drum~~-shaped member~~ 21 of the clutch C1 is linked to the input shaft 2, and the hub unit 22 is linked to the sun gear S1 of the second planetary gear unit PR and ~~,~~ therefore, the hub unit 22 which has a smaller diameter than the drum ~~-shaped member~~ 21 can be linked, for example, with the sun gear S1 that rotates at a high speed in ~~revolution when at~~ sixth speed forward, and compared to the case wherein the sun gear S1 is linked to the drum-shaped member, the centrifugal force can be reduced, and ~~the decrease of~~ controllability of the clutch C1 when engaging and releasing can be retained ~~prevented~~.

Sixth Embodiment

Next, the sixth embodiment, which is a partial modification of the first embodiment, will be described.

with reference to Fig. 10 through Fig. 12. ~~Fig. 10 is a schematic cross sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the sixth embodiment, Fig. 11 is a operational table of an automatic transmission relating to the sixth embodiment, and Fig. 12 is a speed line diagram of an automatic transmission relating to the sixth embodiment. Now,~~ Components of the sixth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except ~~for partial~~ where modifi~~cations~~ed.

As Fig. 10 illustrates, the automatic transmission ~~device~~ 1_6 of the ~~automatic transmission relating to the~~ ~~fourth~~ sixth embodiment ~~configures~~ includes a brake B3 (the "reduced rotation output means," the "third engaging component," the "third brake") in place of the clutch C1, and ~~changed~~ the carrier CR1 of the planetary gear PR ~~so as to be~~ is capable of being fixed by the brake B3, ~~compared to that of the~~ in which respects it differs from automatic transmission ~~device~~ 1_1 of the automatic transmission of the first embodiment (see Fig. 1).

The brake B3 is ~~configured~~ located on the ~~opposite~~ side of the opposite the first planetary gear unit PU (right side of diagram) of the second planetary gear unit PR ~~within this automatic transmission device 1_6~~. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, ~~a~~ friction plates 76, and a hub unit 33.

The hub unit 33 of ~~this~~ brake B3 is connected to one side plate of the carrier CR1, and ~~this~~ carrier CR1 is rotatably supported by the input shaft 2 or the boss ~~unit~~ 3a. ~~so as to be capable of rotating~~. Further, the sun gear S1 is connected to the input shaft 2. Also, ~~this~~ ring gear R1 is connected to the ~~transmitting member 30, and the~~ sun gear S3 ~~is connected~~ via ~~this~~ transmitting member 30.

~~Continuing, based on the above-mentioned construction, the~~ Operations of the automatic transmission ~~device~~ 1_6 will now be described with reference to ~~following Fig. 10,~~ Fig. 11 and Fig. 12. ~~below.~~ As described in connection with the ~~Now, similar to the above-described~~ first embodiment, the vertical lines in ~~axis of~~ the speed line diagram of ~~illustrated in~~ Fig. 12 indicate the speeds ~~revolutions~~ of various rotary ~~each rotation~~ components, and the horizontal axis shows ~~indicates~~ the corresponding gear ratios of these these ~~rotation~~ components. In ~~Further, regarding~~ the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side in ~~of~~ Fig. 12 corresponds to the sun gear S3, and, ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical lines ~~axis~~ correspond~~s~~ to the ring gear R3, the carrier CR2, and the sun gear S2. Further, in ~~regarding~~ the planetary gear PR section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 12 corresponds to the sun gear S1, and, ~~hereafter~~ moving to the left ~~direction~~ within the diagram,

the vertical ~~axis~~ lines correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the ~~width~~ distances between these vertical ~~axes~~ lines are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to ~~the inverse of~~ the number of teeth of each of the ring gears R1, R3. Also, the dotted line ~~in a~~ horizontal ~~direction~~ within the diagram ~~illustrate that~~ represents the rotation ~~is~~ transmitted ~~from~~ by the transmitting member 30.

As illustrated in Fig. 10, the ~~above-mentioned~~ carrier CR1 is fixed to the case 3 by engagement of the brake B3 ~~retaining~~. Further, the rotation of the input shaft 2 is input to the sun gear S1, and the ~~above-mentioned~~ ring gear R1 rotates a lower speed ~~decreases rotation speed based on~~ than the speed of rotation of the input shaft 2 that is input to ~~this~~ the sun gear S1, ~~by this~~ with carrier CR1 being fixed. In other words, the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 30, by engaging the brake B3.

~~By doing so,~~ As Fig. 11 and Fig. 12 illustrate, regarding the planetary gear PR, ~~at~~ in first speed forward, second speed forward, third speed forward, and fourth speed forward, the rotation of the input shaft 2 is input to the sun gear S1 by ~~retaining~~ engaging the brake B3, the carrier CR1 is fixed, and the reduced speed rotation is output to the ring gear R3 by the rotation of the sun gear S1 ~~wherein~~ which receives the rotation of the input shaft 2 ~~is input,~~ and the reduced speed rotation is

input to the sun gear S3 via the transmitting member 30. In this case, the ring gear R1 and the sun gear S3 are rotating at reduced speed, and therefore the ~~above-mentioned~~ transmitting member 30 transmits ~~performs~~ a relatively large torque, ~~transmission.~~ On the other hand, in ~~at~~ fifth speed forward, sixth speed forward, and first speed reverse, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, and further, because the brake B3 is released, as Fig. 12 illustrates, the carrier CR1 rotates based on ~~each rotation within~~ the speed ~~level~~ of ~~this~~ ring gear R1 and the sun gear S1 ~~of the rotation of the input shaft 2.~~

~~Now,~~ The operations of the second planetary gear unit of the sixth embodiment ~~actions~~, other than those ~~of the above~~ mentioned above, ~~planetary gear PR~~ are similar to those of the above-described first embodiment, and accordingly, description thereof will be omitted.

As described above, in ~~according to~~ the automatic transmission ~~device~~ 1_6 of the sixth embodiment ~~relating to the present invention~~, the second planetary gear unit PR and the brake B3 are located ~~configured~~ on one axial side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 and the clutch C3 are located ~~configured~~ on the other side ~~in the~~ axial ~~direction~~ of the first planetary gear unit PU. Therefore, the ~~an~~ automatic transmission ~~can be provided that~~ will achieve six forward speeds and one reverse speed, with direct coupling in ~~at~~ fifth speed forward. Compared ~~For~~ for example, with ~~compared to~~ the case wherein the clutch C2 or clutch C3 is

~~configured~~ located between the second planetary gear unit PR and the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ located closer together, and the transmitting member 30 ~~for transmitting the reduced rotation~~ can be made relatively shorter. Therefore, the automatic transmission can be made more compact and lightweight, and further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, because the oil pressure servo 13 is ~~provided~~ mounted on the input shaft 2, one set of the seal rings 82 form a seal between the ~~case~~ boss 3b and ~~supply oil to the~~ oil lines 2b provided within the input shaft 2, and therefore oil can be supplied to the oil compartment of the ~~oil pressure~~ hydraulic servo~~s~~ 13 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servo~~s~~ 13. Further, the ~~oil pressure~~ hydraulic servo 12 can ~~supply~~ receive oil directly from the boss ~~unit~~ 3b ~~provided from the case 3~~, without passing through other units. ~~for example,~~ In other words, ~~can~~ supply of oil is secured by providing one set of ~~the~~ seal rings 83. Therefore, oil can be supplied simply by providing one set of ~~the~~ seal rings 82 and 83 ~~each~~ for each of the ~~oil pressure~~ hydraulic servos 12 and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, when ~~since~~ the clutch C2 ~~is a clutch that~~ engages in ~~while at~~ first speed reverse, ~~when this clutch 2 is engaged at first speed reverse,~~ the transmitting member 30 rotates in ~~a~~ reverse ~~rotation~~, and ~~while~~ the hub unit 24, that connects this clutch C2 and the sun gear S2, has the same rotational speed as the input shaft 2 ~~by engaging this clutch C2, there may be cases wherein the rotation~~ and the difference in rotational speed between ~~of~~ the transmitting member 30 and the hub unit 24 may be ~~becomes~~ large. However, ~~but~~ because this clutch C2 is located on the ~~opposite~~ side of the first opposite ~~of~~ the second planetary gear unit PR, ~~via the~~ planetary gear unit PU, the transmitting member 30 and the hub unit 24 can be spaced ~~configured~~ apart from one another. Compared to the case wherein, for example, those parts come in contact in ~~due to~~ a multi-axial construction, loss in ~~the decreased~~ efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be prevented.

Further, because the counter gear 5 is located ~~configured in the~~ axially ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be located ~~configured~~ in approximately the axial center ~~in the axial direction~~ of the automatic transmission. As in the previous embodiments, ~~For example~~, when the automatic transmission is mounted on the vehicle, enlarg~~ing~~ement towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side facing ~~from~~ the drive source is the "front") ~~direction)~~ is not necessary ~~can be prevented~~ because the counter gear 5

is mounted to ~~match~~ mate with the drive wheel transmission mechanism. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~The~~ Its interference ~~toward~~ with the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ is improved, ~~such~~ and the steering angle ~~being~~ can be greatly improved, for example.

Further, because output of the reduced speed rotation ~~output~~ to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to~~ controlled by engagement and disengagement of ~~by~~ the brake B3, the number of ~~parts~~ components (for example ~~drum-shaped members~~ clutch drums and so forth) can be reduced as compared to the case wherein, for example, a clutch C1 is provided. Further, because the brake B3 can ~~configure an~~ receive oil ~~line~~ directly from the case 3, ~~and therefore the~~ construction of an oil line can be simplified as compared to the case wherein, for example, a clutch C1 is provided.

Further, because the automatic transmission ~~device~~ 1_6 ~~according~~ ~~to~~ of the ~~present~~ sixth embodiment is ~~a transmission device that is~~ directly coupled at fifth speed forward, ~~Therefore, at~~ in first speed forward or fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ better set for efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized~~ run with better ~~revolutions~~ efficiency, and this contributes to increased fuel economy of the vehicle while running at a low to medium speed.

~~In order to solve the above-described problems,~~

proposals have been made such as those in Japanese Unexamined Patent Application Publication No. 8-68456. However, the product in this Publication has a construction wherein a clutch is configured on the line that transmits the reduced rotation of the reducing planetary gear to the rotation component of the planetary gear unit, and because the line that transmits this reduced rotation is a line wherein a large torque is input, the clutch or members that transmit the torque must be constructed so as to withstand this large torque. Further, the line for transmitting this reduced rotation is a part for rotating at a high speed for example when at sixth speed forward, and therefore, as in the above-mentioned Publication, if the construction links the drum of the clutch to the rotation component of the planetary gear unit, controllability is lost when engaging and releasing this clutch because the drum unit changes shape because of the centrifugal force due to the high revolutions. Therefore, it is an object of the present invention to provide an automatic transmission wherein the controllability of the clutch is not lost as a reduced rotation output means, even at a high speed revolution of the rotation ~~component of the planetary gear unit.~~

~~Therefore, according to~~ In the automatic transmission device 1_6 ~~relating to~~ of the ~~present~~ sixth embodiment, the carrier CR1 is fixed by the brake B3, and therefore, compared to the

case wherein ~~the~~ a clutch ~~that makes~~ is used to connect/disconnect ring gear R1 and the sun gear S3 ~~capable of disengaging~~, the load on the brake B3 can be reduced, this brake B3 can be made more compact, and the automatic transmission can also be made more compact.

~~Now,~~ While the ~~above~~ first through sixth embodiments relating to the present invention have been described above as being applicable to an automatic transmission having a torque converter, ~~but should~~ they are not ~~be~~ so limited ~~to this~~, and any motion starting device may be used that ~~would~~ transmits torque (rotation) at start of movement. Further, ~~a case wherein~~ while described ~~this is~~ as mounted on a vehicle with an engine as a drive source ~~has been described~~, ~~but should not be~~ the invention is not so limited ~~to this~~, and any drive source may be used as a matter of course, and ~~this~~ the transmission of the present invention may be mounted on a hybrid vehicle. Further, while the above-~~mentioned~~ described automatic transmission embodiments are ~~is~~ favorably ~~for~~ used in a FF vehicle, ~~but should not be~~ again the present invention is not so limited ~~to this~~, and can be used in a FR vehicle, a four-wheel drive vehicle, or vehicles with other types of drive systems.

Further, ~~regarding~~ while the speed reducing planetary gear unit according to the above first through sixth embodiments has been described as ~~one that~~ reducing a rotation speed of the ring gear by fixing the carrier while inputting the rotation of the input shaft into the sun gear, ~~but should~~ the invention is not ~~be~~ so limited ~~to this~~, and may reduce a rotation speed of the ring gear by fixing the sun gear while inputting the rotation of

the input shaft into the carrier.

~~Industrial Applicability~~

As described above, the automatic transmission according to the present invention is beneficially mounted on vehicles, such as automobiles, trucks, busses, and so forth, ~~and is particularly suitable for use with vehicles~~ which require reduction in size and reduction in weight ~~from mountability to the vehicle~~, and further require reduction of ~~in~~ shock in ~~of~~ changing speeds.

ABSTRACT

A planetary gear unit PR and a clutch C1 for outputting reduced speed rotation are ~~configured~~ located on one axial side of a planetary gear unit PU ~~in the axial direction (right side of the diagram) along~~ with an output unit ~~being disposed between a planetary gear unit and reduced rotation output means, and a~~ located therebetween. A clutch C2 which ~~for~~ connect~~ing and~~s disconnect~~ing the rotation of~~s an input shaft 2 ~~input~~ ~~to~~ from a sun gear S2 of the planetary gear unit PU and a clutch C3 ~~for~~ connect~~ing~~s and disconnect~~ing the rotation of~~s the input shaft ~~2 input~~ ~~to~~ from a carrier CR2 of the planetary gear unit are ~~configured~~ on the other axial side ~~(left side of the diagram)~~ of the planetary gear unit PU, ~~in the axial direction. By doing so,~~ Compared with a transmission ~~to the case~~ where~~in~~ a clutch C2 or clutch C3 is ~~configured~~ located between the planetary gear PR and the planetary gear unit PU, the planetary gear PR and the planetary gear unit PU can be ~~configured~~ located closes together, and a ~~transmitting~~ member which ~~so that~~ transmits the reduced speed rotation ~~becomes~~ can be made shorter. Further, compared to the case wherein, for example, the clutches C1, C2, C3 are ~~configured~~ located together on one side ~~of the~~ axial ~~direction~~, ~~the construction of an~~ oil supply to their servos ~~line~~ is simplified.